COMPARISON OF THE CONTINUOUS SPECTRA OF SOME LARGE AND SMALL PROPER-MOTION STARS.

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In a recent number of the *Astrophysical Journal* I gave the results of a comparison of the relative intensity at about λ 4200 and λ 5000 of the spectra of a few pairs of stars of large and small proper motion which had identical spectral types. The spectra of the two stars were obtained upon the same plate and at as nearly as possible the same zenith distance. A considerable majority of the photographs showed the spectrum of the star of small proper motion to be distinctly weaker at the violet end of the spectrum than that of the star of large proper motion. A few pairs showed little or no difference, but in no case was the spectrum of the small proper-motion star stronger in the violet.

The amount of material available for this comparison was small. Accordingly, it seemed desirable to make an attempt to see whether the large number of radial velocity photographs could not be utilized for a similar purpose. For individual stars, of course, the results would be of little value, since the plates were taken at different zenith distances, under varying atmospheric conditions, and subjected to different development. For the mean of a considerable number of photographs and stars, however, these effects should counteract each other largely, and it seemed probable that results of some interest could be obtained.

The spectra compared were those of about one hundred stars of large proper motion, whose parallaxes have been measured, and of about sixty stars of very small proper motion with spectral types ranging between F and M. No plates were included which were obtained at very great zenith distances, or under unfavorable conditions of transparency. The method of comparison employed, tho necessarily very crude as compared with photometric measures of density, had the advantage of rapidity, and appeared to be sufficiently accurate for the

character of the material available. A standard plate of *α Tauri* was first obtained, several spectra taken with different exposure times being placed side by side on the negative. The photograph of each star was then compared with the standard plate under a spectrocomparator, and estimates were made of the intensity of its continuous spectrum relative to that of *α Tauri* at three selected points at the violet end of the spectrum, and four points at the red end. The estimates were made in tenths of a unit between two of the *α Tauri* exposures. Thus 1.4 means that the density of the continuous spectrum is estimated to be 0.4 greater than the first spectrum of *α Tauri,* or 0.6 less than the second spectrum. After the comparisons had been finished the *α Tauri* photograph was measured under a Hartmann micro-photometer and the densities calculated. The results for all of the stars were then reduced to densities. Since the plates of both large and small proper-motion stars were taken at random during the estimation of intensities, and since the comparison is purely differential, it is difficult to see how any considerable systematic error could have entered into the results.

The values for the groups of stars compared are given below, the density scale being an arbitrary one which depends on the photographic wedge in the micro-photometer:—

	Number of Stars	Average μ	Average Type	Density at λ 4220	Density at λ 4599
F0 - F9	10	0″.012	F4	0.25	0.37
	23	0 .66	F6	0.32	0.37
G0 - G4	8	0 .009	G3	0.22	0.41
	30	0 .64	G2	0.33	0.41
G5 - G9	14	0 .011	G7	0.25	0.48
	22	0 .64	G7	0.40	0.48
K0 - K4	24	0 .011	K2	0.16	0.44
	20	0 .70	K1	0.31	0.44
K5 - K9	5	0 .012	K5	0.15	0.51
	5	2 .18	K7	0.27	0.51

The result for the K5-K9 groups is of low weight, the number of stars being small, and the spectra too faint at the violet end. The star 61^2 *Cygni* is included in this group, which accounts for the very large proper motion.

The two features of note in these results are:—

1. The small proper-motion stars are decidedly weaker at the violet end of the spectrum than the large proper-motion stars.

2. The difference is least for the F stars, and increases with advancing spectral type at least as far as K.

The latter result is in agreement with a few observations on A type stars which show essentially no difference at the violet end of the spectrum between two groups of stars having proper motions of $0''.020$ and $0''.13$. It is true, however, that if the proper motions are interpreted in terms of distance the difference of distance indicated is much less between the two groups of A stars than between the groups of F to K stars given above. Hence on the basis of absorption of light in space it might not be possible to detect a difference in the violet portion of the spectrum for such a comparatively small difference of distance. The different groups of F, G and K stars, however, have so nearly the same average proper motion that should further observations confirm the change in the amount of absorption in the violet, it would seem almost inevitable to ascribe at least a part of the effect to conditions in the stellar atmosphere. In other words, to an effect of absolute magnitude, as Professor KAPTEYN concisely describes it.